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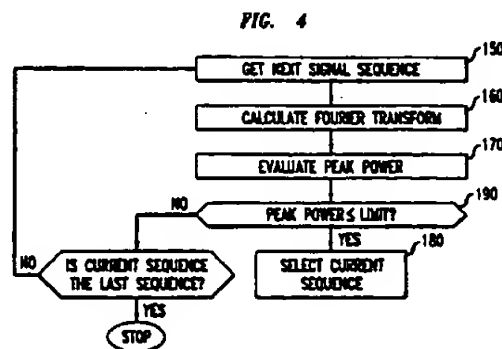
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(54) Reduction of peak to average power ratio in multicarrier systems

(57) We describe an improved method for decreasing the probability of an unacceptably high peak-to-average power ratio in a signal to be transmitted by a Frequency Division Multiplexing (FDM) system, such as a discrete multitone (DMT) system. The method involves generating at least two alternative signal sequences, computing Fourier transforms of the respective alternative signal sequences, and selecting for transmission one of these sequences, based on the Fourier transform computations. More specifically, the selection of one sequence may be based, e.g., on the determination that the Fourier transform of that sequence has an acceptable peak power. Alternatively, a comparison may be made among the Fourier transforms of the respective signal sequences, and selection made of that sequence whose Fourier transform exhibits the lowest peak power.



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# EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	WO 96 10567 A (MARUHO KK ;MATSUI TAKEAKI (JP); YAMAZAKI HIROFUMI (JP); HASHINAGA) 11 April 1996 (1996-04-11) * abstract * * page 6, last paragraph - page 8, paragraph 1 * * figures 1-3 * * claims 1,5,8,11-13,16 * ---	1	H04L27/26
A,D	TAN B T ET AL: "CREST FACTOR MINIMISATION IN FDM PSK SYSTEMS" ELECTRONICS LETTERS,GB,IEE STEVENAGE, vol. 26, no. 13, 21 June 1990 (1990-06-21), pages 859-861, XP000107955 ISSN: 0013-5194 * the whole document * ---	1	
A	US 5 201 071 A (WEBB KENNETH F) 6 April 1993 (1993-04-06) * column 1, line 59 - column 2, line 7 * * column 4, line 10 - line 36 * * figure 5 * ---	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	US 5 610 908 A (MADDOCKS MARK CHARLES D ET AL) 11 March 1997 (1997-03-11) * abstract * * column 2, line 54 - column 3, line 57 * * figure 5 * ---	1	H04L
A	EP 0 735 731 A (VICTOR COMPANY OF JAPAN) 2 October 1996 (1996-10-02) * abstract * * claims 1,2 * * figures 4,10-12 * --- -/-	1	
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>13 March 2000</b>	Examiner <b>Langinieux, F</b>
CATEGORY OF CITED DOCUMENTS X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document		T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons --- &: member of the same patent family, corresponding document	

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Application Number  
EP 99 30 1548

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	WO 96 13918 A (AIRNET COMMUNICATIONS CORP) 1 9 May 1996 (1996-05-09) * page 5, paragraphs 1-3 * * page 10, paragraph 2 - page 11, paragraph 2 * * figure 1 *	1	
A	--- NARAHASHI S ET AL: "MINIMISING PEAK-TO-AVERAGE POWER RATIO OF MULTITONE SIGNALS USING STEEPEST DESCENT METHOD" ELECTRONICS LETTERS, GB, IEE STEVENAGE, vol. 31, no. 18, 31 August 1995 (1995-08-31), pages 1552-1554, XP000530948 ISSN: 0013-5194 * abstract * * figure 2 * -----	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>13 March 2000</b>	Examiner <b>Langinieux, F</b>
<b>CATEGORY OF CITED DOCUMENTS</b> X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document		T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document	

EPO FORM 1503 03/02 (P4/C21)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 30 1548

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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13-03-2000

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9610567	A	11-04-1996	NONE	
US 5201071	A	06-04-1993	NONE	
US 5610908	A	11-03-1997	AU 4975493 A	29-03-1994
			DE 69322785 D	04-02-1999
			DE 69322785 T	20-05-1999
			EP 0658295 A	21-06-1995
			WO 9406231 A	17-03-1994
			GB 2270819 A,B	23-03-1994
			JP 8501195 T	06-02-1996
EP 0735731	A	02-10-1996	JP 2735025 B	02-04-1998
			JP 8274748 A	18-10-1996
			JP 9107345 A	22-04-1997
WO 9613918	A	09-05-1996	US 5838732 A	17-11-1998
			AU 4017795 A	23-05-1996

EPO FORM P0458

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